

## 1.6X Linear Fan Driver

### Features

- VO Follows 1.6 Times of VSET
- 150mV Dropout @ 0.5A
- Over Current and Over Temperature Protection
- Enable Pin
- 10 $\mu$ A Quiescent Current in Shutdown
- Soft Start to Decrease Inrush Current
- Power SOP-8 and TDFN3X3-8 Package

### Applications

- Notebook Computer Fan Driver
- Battery Powered Systems
- Motherboards
- Peripheral Cards

### General Description

The G996 is a high performance positive voltage regulator designed for use in applications requiring very low dropout voltage at up to 0.5 Amps. The G996 VO output voltage follows the 1.6 times of VSET voltage until it reaches VIN voltage. The VSET voltage must be larger than 1V to guarantee VO 1.6 times of VSET. An enable pin further reduces power dissipation while shut down. The G996 provides excellent regulation over variations in line, load and temperature.

The G996 is available in the power SOP-8 and TDFN3X3-8 package.

### Ordering Information

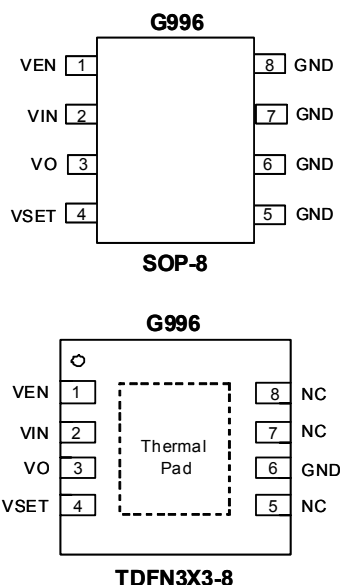
ORDER NUMBER	MARKING	TEMP. RANGE	PACKAGE (Pb free)
G996P11U	G996	-40°C ~ +85°C	SOP-8
G996RD1U	996	-40°C ~ +85°C	TDFN3X3-8

Note: P1: SOP-8 RD: TDFN3X3-8

1: Bonding Code

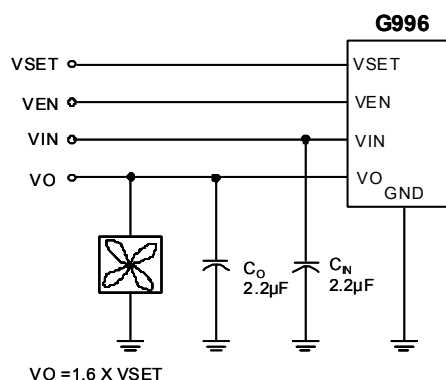
U: Tape & Reel

### Pin Configuration



Note: Recommend connecting the Thermal Pad to the GND for power dissipation.

### Typical Application Circuit



## Absolute Maximum Ratings (Note 1)

Input Voltage	7V
V <sub>EN</sub> Voltage	7V
Power Dissipation Internally Limited (Note 2)	
Maximum Junction Temperature	150°C
Storage Temperature Range	65°C ≤ T <sub>J</sub> ≤ +150°C
Reflow Temperature (soldering, 10sec)	260°C
Thermal Resistance Junction to Ambient, (θ <sub>JA</sub> )	
SOP-8	156°C/W*
TDFN3X3-8 (1oz of 1in <sup>2</sup> copper area)	96°C/W
Continuous Power Dissipation (T <sub>A</sub> =25°C)*	
SOP-8	0.8W*
TDFN3X3-8 (1oz of 1in <sup>2</sup> copper area)	1.3W

Thermal Resistance Junction to Case, (θ <sub>JC</sub> )	
SOP-8	39°C/W
TDFN3X3-8	30°C/W
ESD Rating (Human Body Model)	2kV

## Operation Conditions (Note 1)

Input Voltage	4.5V ~ 5.5V
Temperature Range	-40°C ≤ T <sub>A</sub> ≤ +85°C

\* Please refer to "Recommended Minimum Footprint".

## Electrical Characteristics

V<sub>SET</sub>=2V, V<sub>EN</sub>=V<sub>IN</sub>, V<sub>IN</sub>=5V, I<sub>O</sub>=0.5A, C<sub>IN</sub>=2.2μF, C<sub>OUT</sub>=2.2μF, T<sub>A</sub>=T<sub>J</sub>=25°C unless otherwise specified (Note 3)

PARAMETER	CONDITION	MIN	TYP	MAX	UNIT
<b>VIN</b>					
Supply Voltage Range		4.5	---	5.5	V
Quiescent Current	V <sub>O</sub> = 5V	---	1	---	mA
	V <sub>EN</sub> = 0V	---	10	50	μA
<b>VO</b>					
Output Voltage/V <sub>SET</sub> voltage	V <sub>IN</sub> = 5.5V, V <sub>SET</sub> = 1V~3.2V	1.552	1.6	1.648	V/V
Line Regulation	V <sub>IN</sub> = 4.5V to 5.5V	---	0.2	0.5	%
Load Regulation	10mA ≤ I <sub>O</sub> ≤ 0.5A	---	0.26	0.8	%
Output Resistance	I <sub>O</sub> = 0.5A, V <sub>SET</sub> = 3.4V	---	0.22	0.3	Ω
Short Circuit Current		---	1	---	A
<b>VSET</b>					
Minimum V <sub>SET</sub> voltage		---	1	---	V
V <sub>SET</sub> pin Current		---	80	200	nA
<b>VEN</b>					
V <sub>EN</sub> Voltage High		1.6	---	---	V
V <sub>EN</sub> Voltage Low		---	---	0.4	V
V <sub>EN</sub> pin Bias Current	V <sub>EN</sub> = 0V	---	7	10	μA
<b>Over Temperature Protection</b>					
Over Temperature		---	150	---	°C
Over Temperature Hysteresis		---	25	---	°C

**Note 1:** Absolute Maximum Ratings are limits beyond which damage to the device may occur. Operating Conditions are conditions under which the device functions but the specifications might not be guaranteed. For guaranteed specifications and test conditions see the Electrical Characteristics.

**Note2:** The maximum power dissipation is a function of the maximum junction temperature, T<sub>Jmax</sub>; total thermal resistance, θ<sub>JA</sub>, and ambient temperature T<sub>A</sub>. The maximum allowable power dissipation at any ambient temperature is (T<sub>Jmax</sub>-T<sub>A</sub>) / θ<sub>JA</sub>. If this dissipation is exceeded, the die temperature will rise above 150°C and IC will go into thermal shutdown.

**Note3:** Low duty pulse techniques are used during test to maintain junction temperature as close to ambient as possible.

## Definitions

### Line Regulation

The change in output voltage for a change in input voltage. The measurement is made under conditions of low dissipation or by using pulse techniques such that average chip temperature is not significantly affected.

### Load Regulation

The change in output voltage for a change in load current at constant chip temperature. The measurement is made under conditions of low dissipation or by

using pulse techniques such that average chip temperature is not significantly affected.

### Maximum Power Dissipation

The maximum total device dissipation for which the regulator will operate within specifications.

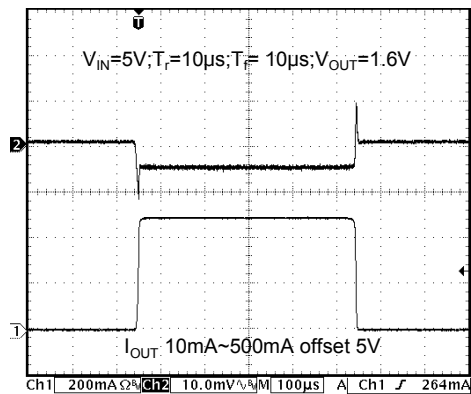
### Quiescent Bias Current

Current which is used to operate the regulator chip and is not delivered to the load.

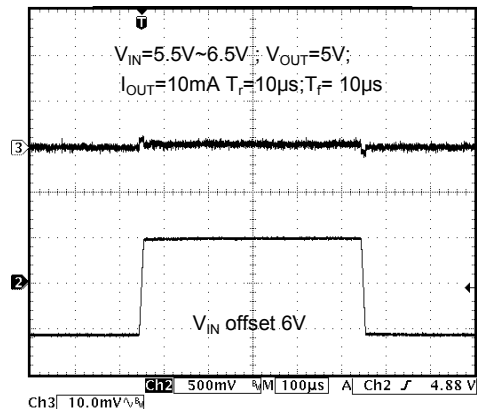
# Typical Performance Characteristics

$V_{SET}=2V$ ,  $V_{EN}=V_{IN}$ ,  $V_{IN}=5V$ ,  $I_O=0.5A$ ,  $C_{IN}=4.7\mu F$ ,  $C_{OUT}=10\mu F$ ,  $T_A=T_J=25^\circ C$ .

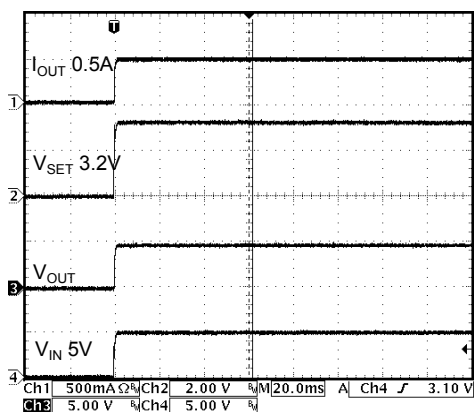
**Load Transient**



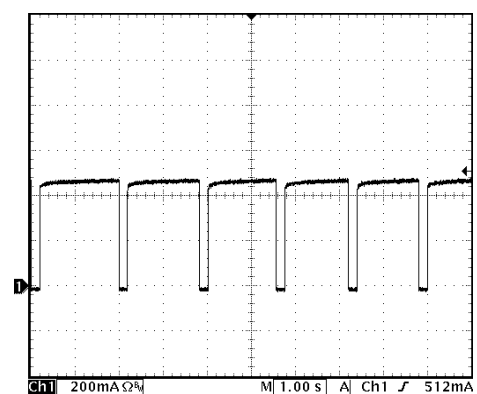
**Line Transient**



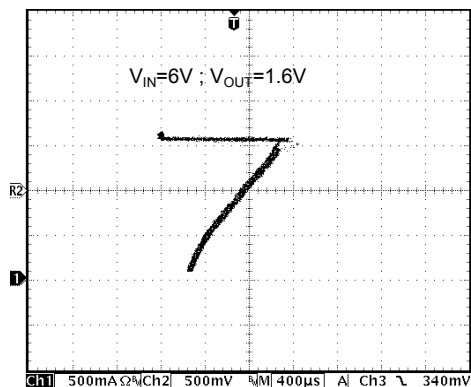
**Start-UP**



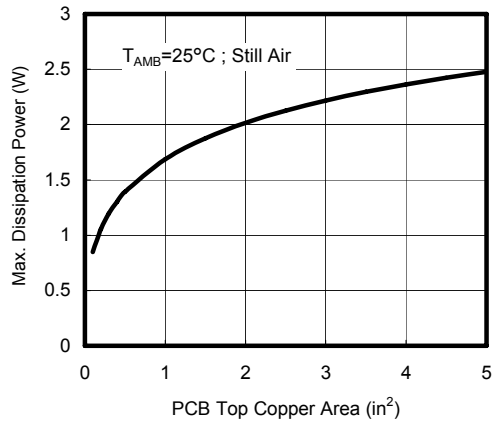
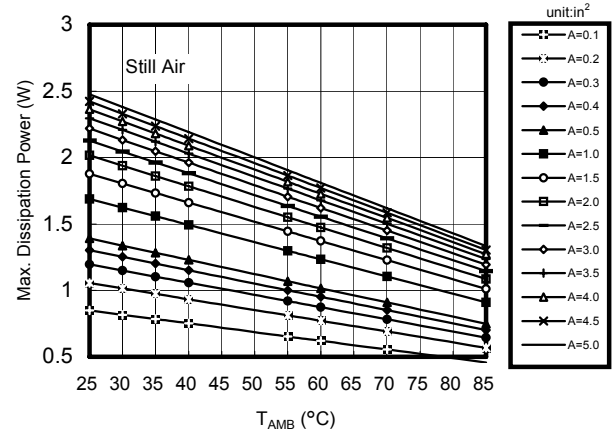
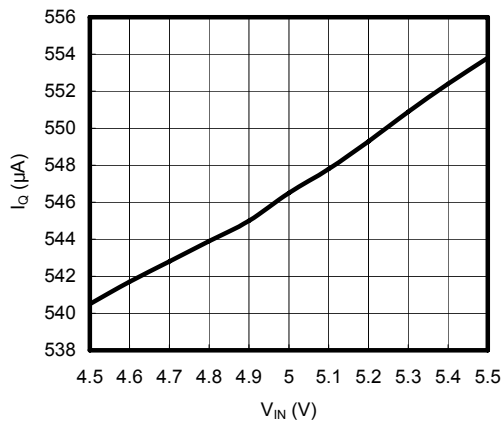
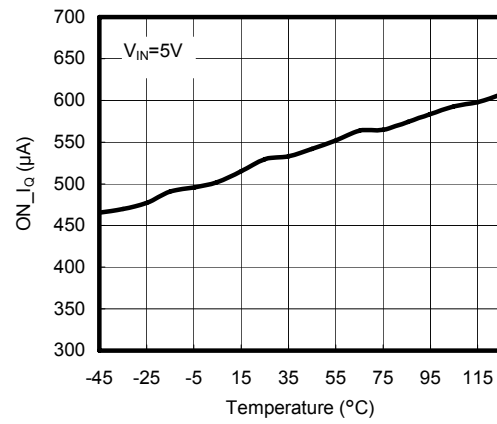
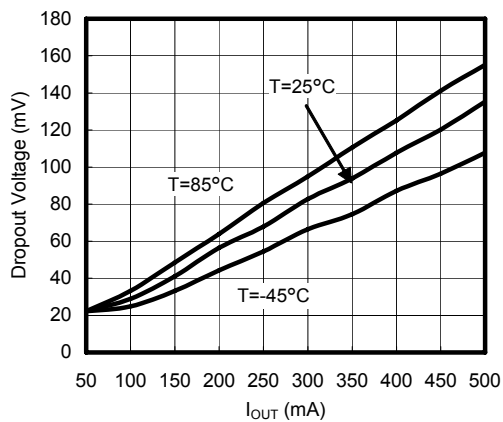
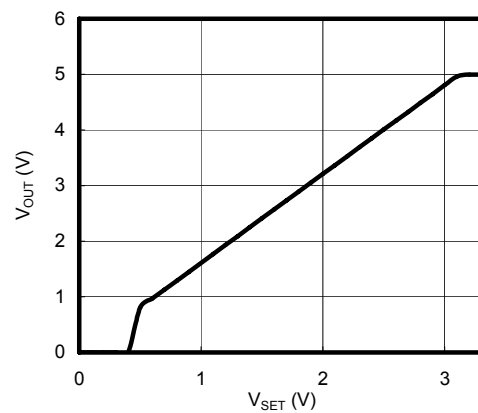
**Short Circuit Current**



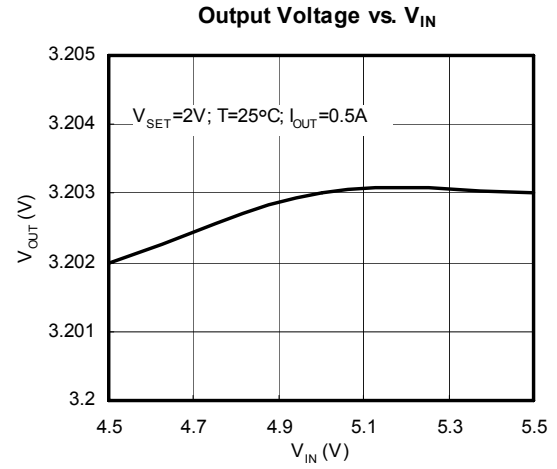
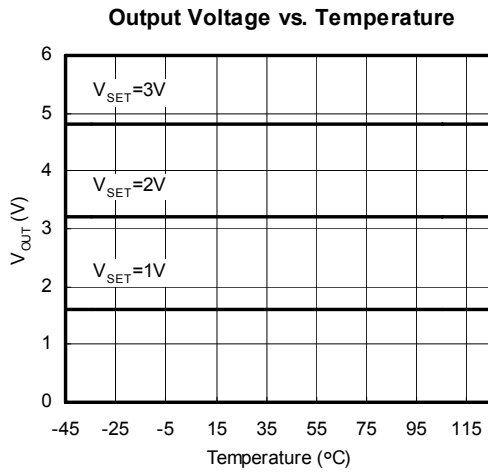
**Overcurrent Protection Characteristics**



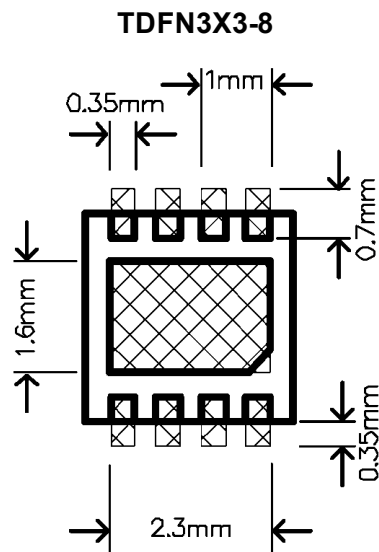
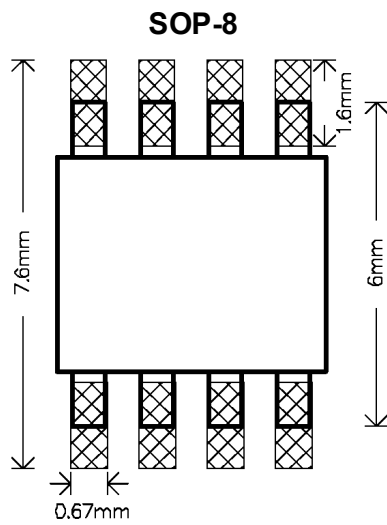
## Typical Performance Characteristics (continued)

**Max. Power Dissipation vs. PCB Top Copper Area**

**Max. Power Dissipation vs. T<sub>AMB</sub>**

**Quiescent Current vs. V<sub>IN</sub>**

**Quiescent Current vs. Temperature**

**Dropout Voltage vs. Temperature**

**V<sub>OUT</sub> vs. V<sub>SET</sub>**


Typical Performance Characteristics (continued)



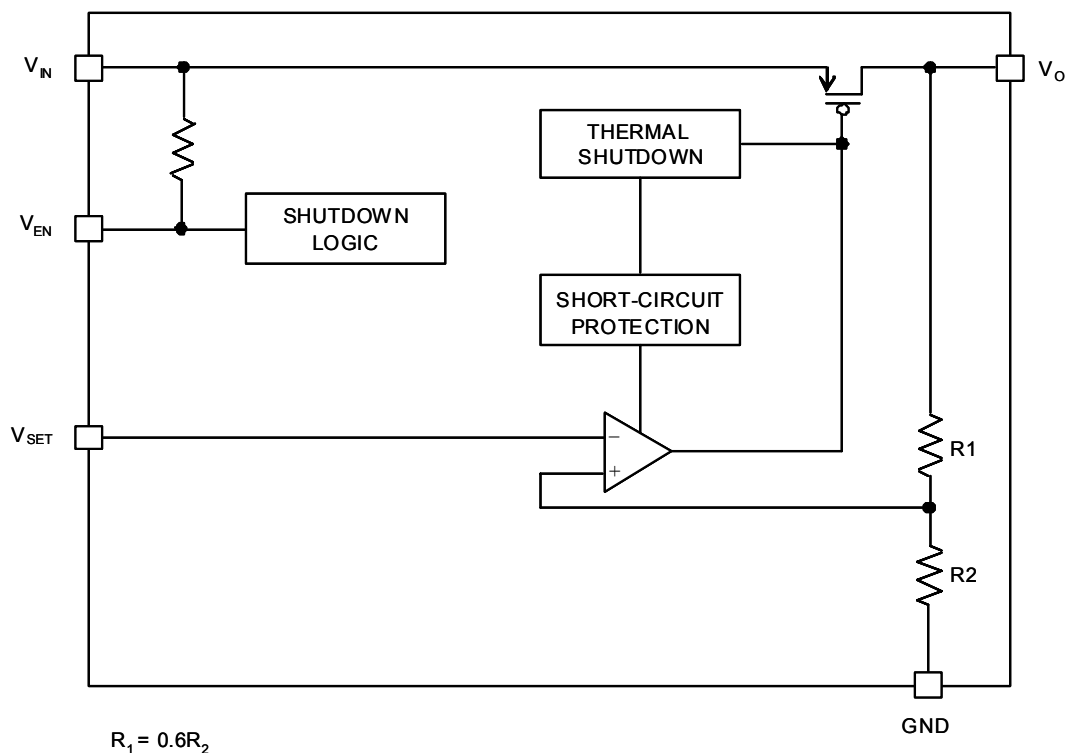
Recommended Minimum Footprint



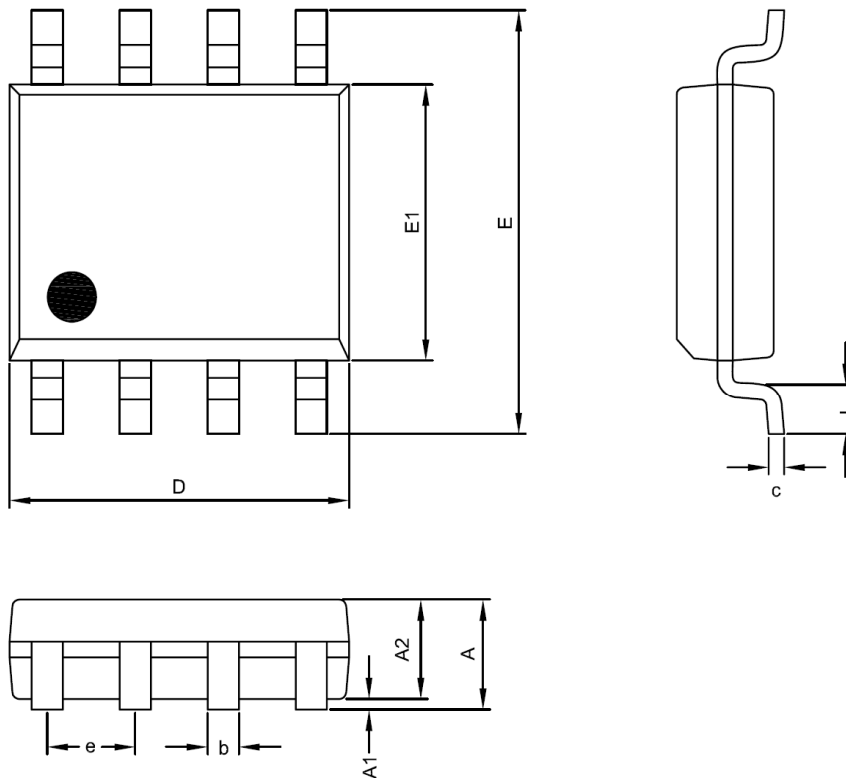
## Pin Description

PIN		NAME	FUNCTION
SOP-8	TDFN3X3-8		
1	1	VEN	Enable Input. Pulling this pin below 0.4V turns the regulator off, reducing the quiescent current to a fraction of its operating value. The device will be enabled if this pin is left open. Connect to VIN if not being used.
2	2	VIN	Input voltage.
3	3	VO	The pin is the power output of the device. Its voltage is 1.6 times of VSET.
4	4	VSET	This pin sets the output voltage. Its voltage must be larger than 1V to guarantee VO 1.6 times of VSET.
5~8	6	GND	Reference ground. Use all four pins on the SOP-8 device for heatsinking.
	5,7,8	NC	No connection
	Thermal Pad		Recommend connecting the Thermal Pad to the GND for power dissipation.

## Block Diagram



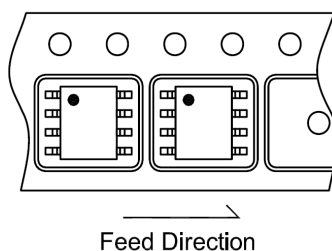
## Package Information



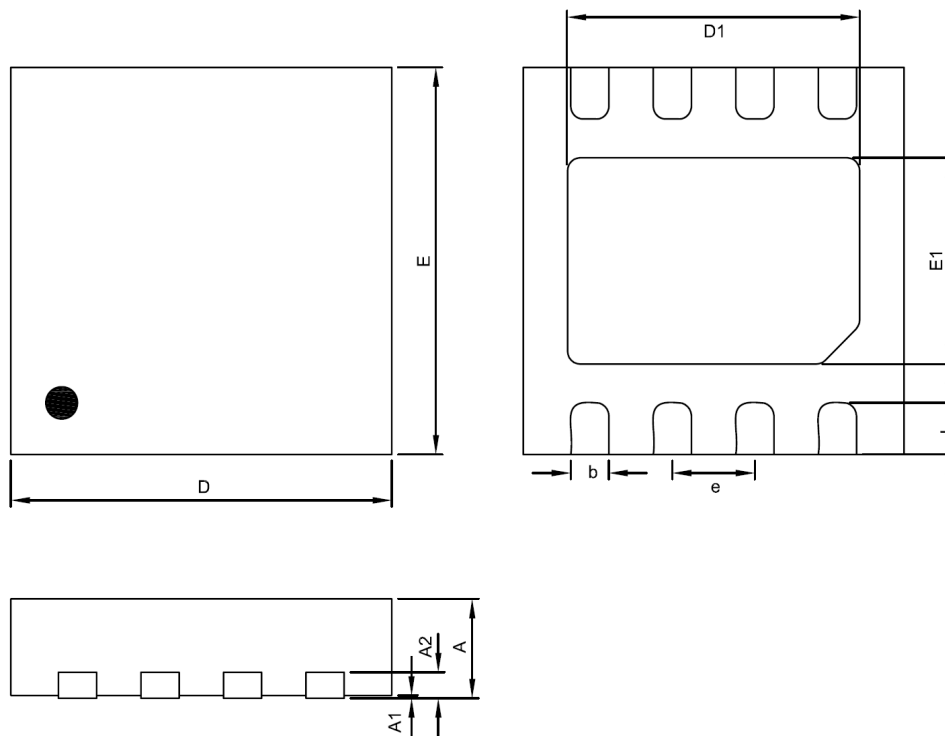
**SOP-8 (P1) Package**

Symble	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	1.35	1.55	1.75	0.053	0.061	0.069
A1	0.00	---	0.25	0.000	---	0.010
A2	1.15	1.35	1.50	0.045	0.053	0.059
D	4.80	4.90	5.00	0.189	0.192	0.197
E	5.80	6.00	6.20	0.228	0.236	0.244
E1	3.80	3.90	4.00	0.150	0.153	0.157
c	0.19	0.23	0.27	0.007	0.009	0.011
b	0.33	0.43	0.53	0.013	0.017	0.021
e	1.27 BSC			0.050 BSC		
L	0.40	0.7	1.00	0.016	0.028	0.039

## Taping Specification



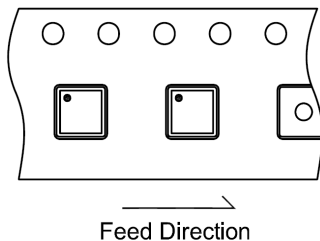
PACKAGE	Q'TY/REEL
SOP-8	2,500 ea



**TDFN3X3-8 Package**

Symble	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80	0.0276	0.0295	0.0315
A1	0.00	---	0.05	0.0000	---	0.0020
A2	0.19	0.20	0.21	0.0075	0.0079	0.0083
D	2.95	3.00	3.05	0.1161	0.1181	0.1201
E	2.95	3.00	3.05	0.1161	0.1181	0.1201
D1	2.20	2.30	2.40	0.0866	0.0906	0.0945
E1	1.40	1.50	1.60	0.0551	0.0591	0.0630
b	0.25	0.30	0.35	0.0098	0.0118	0.0138
e	0.65 BSC			0.0256 BSC		
L	0.30	0.35	0.45	0.0118	0.0138	0.0177

## Taping Specification



PACKAGE	Q'TY/REEL
TDFN3X3-8	3,000 ea